**Ch. 3: Water and the Fitness of the Environment**

**Learning Objective:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ how the properties of \_\_\_\_\_\_\_\_\_ that result from its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ affect its biological function.

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| 1. Why is water important? |  |
| 1. What is the “chemistry” of water?   Image result for water molecule with bonds  Image result for polarity of water | * Water (H2O) is made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * H and O atoms are held together by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Water is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule meaning \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * One water molecule is held to another water molecule by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   + Water can form up to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ making water “sticky.”   FirefoxScreenSnapz002 |
| **Properties of Water** | |
| 1. **COHESION & ADHESION**   **C:\Users\lindsay.faulkner\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\855441D8.tmp**  Image result for water capillary action plants | **Cohesion**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Surface tension** = measure of how difficult it is to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of liquid   * Ex:   **Adhesion:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Capillary action** - Adhesion of H2O to \_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   **Transpiration** = movement of H2O \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * H2O clings to each other by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; cling to xylem tubes by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1. **Good SOLVENT**   **03_07DissolvingSalt-L.jpg**  Image result for hydrophilic vs hydrophobic | **Solvent**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Solute**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Solution**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ makes H2O a good \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * polar H2O molecules surround + & – ions * \_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolve \_\_\_\_\_\_\_\_\_\_\_\_\_ creating \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   **Hydrophilic**   * substances that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * “like” water * polar or non-polar? * What would dissolve in water?   **Hydrophobic**   * substances that don’t have  an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to H2O * “fear” water * polar or non-polar? * What would not dissolve in water? |
| *Why does it matter in a cell?* | |
| 1. **Low Density Solid** | * Why does ice float? * Why is this important?   1.  2.  3. |
| 1. **HIGH SPECIFIC HEAT** | * H2O \_\_\_\_\_\_\_\_\_\_\_ changes in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   + \_\_\_\_\_\_\_\_\_\_\_\_ specific heat   + takes a \_\_\_\_\_ to \_\_\_\_\_\_\_\_\_ it up   + takes a \_\_\_\_\_ to \_\_\_\_\_\_\_\_ it down * H2O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ temperatures on Earth * Why is having a high specific heat important for life on Earth? |
| 1. **HIGH HEAT OF VAPORIZATION** | the amount of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ([enthalpy](https://en.wikipedia.org/wiki/Enthalpy)) that must be added to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ substance, to transform a quantity of that substance into a \_\_\_\_\_\_\_\_\_  **Important because of Evaporative Cooling**   * Molecules with \_\_\_\_\_\_\_\_\_\_\_\_\_ KE leave as \_\_\_\_\_ * \_\_\_\_\_\_\_\_\_\_\_\_\_\_ temp in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Human \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (cooling) |
| 1. **Ionization of water** | Water ionizes:  \_\_\_\_\_ splits off from H2O, leaving \_\_\_\_\_\_   * + - if [H+] = [-OH], water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_     - if [H+] > [-OH], water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_     - if [H+] < [-OH], water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1. http://3.bp.blogspot.com/-7jMoCjWNKkc/UD09TNrx3AI/AAAAAAAAB1g/K488ZLB31rk/s1600/PH-Scale.jpgRecall the pH scale. | * Measures how \_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_ solution is * Range: \_\_\_ → \_\_\_ → \_\_\_ * **Acids** have an excess of \_\_\_\_\_\_\_ ions, and a pH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7.0. * **Bases** have an excess of \_\_\_\_\_\_\_(hydroxide) ions, and a pH \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7.0 * What is the pH range of most living things? |
| 1. How do **BUFFERS** regulate pH in living things? | * Why is pH important? * What do buffers do? |

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| **H2O Property** | **Chemical Explanation** | **Examples of Benefits to Life** |
| Cohesion | * polar * H-bond * like-like | ↑gravity plants, trees |
| Adhesion | * H-bond * unlike-unlike | plants🡪 xylem  blood🡪veins |
| Surface Tension | * diff. in stretch * break surface * H-bond | bugs🡪water |
| Specific Heat | * Absorbs & retains E * H-bond | ocean🡪mod temp 🡪protect marine life |
| Evaporation | * liquid🡪gas * KE | Cooling  Homeostasis |
| Universal Substance | * Polarity🡪ionic * H-bond | Good dissolver  solvent |